

FIG.1 SPEECH RECOGNITION BASED INTERACTIVE INFORMATION RETRIEVAL APPARATUS 1

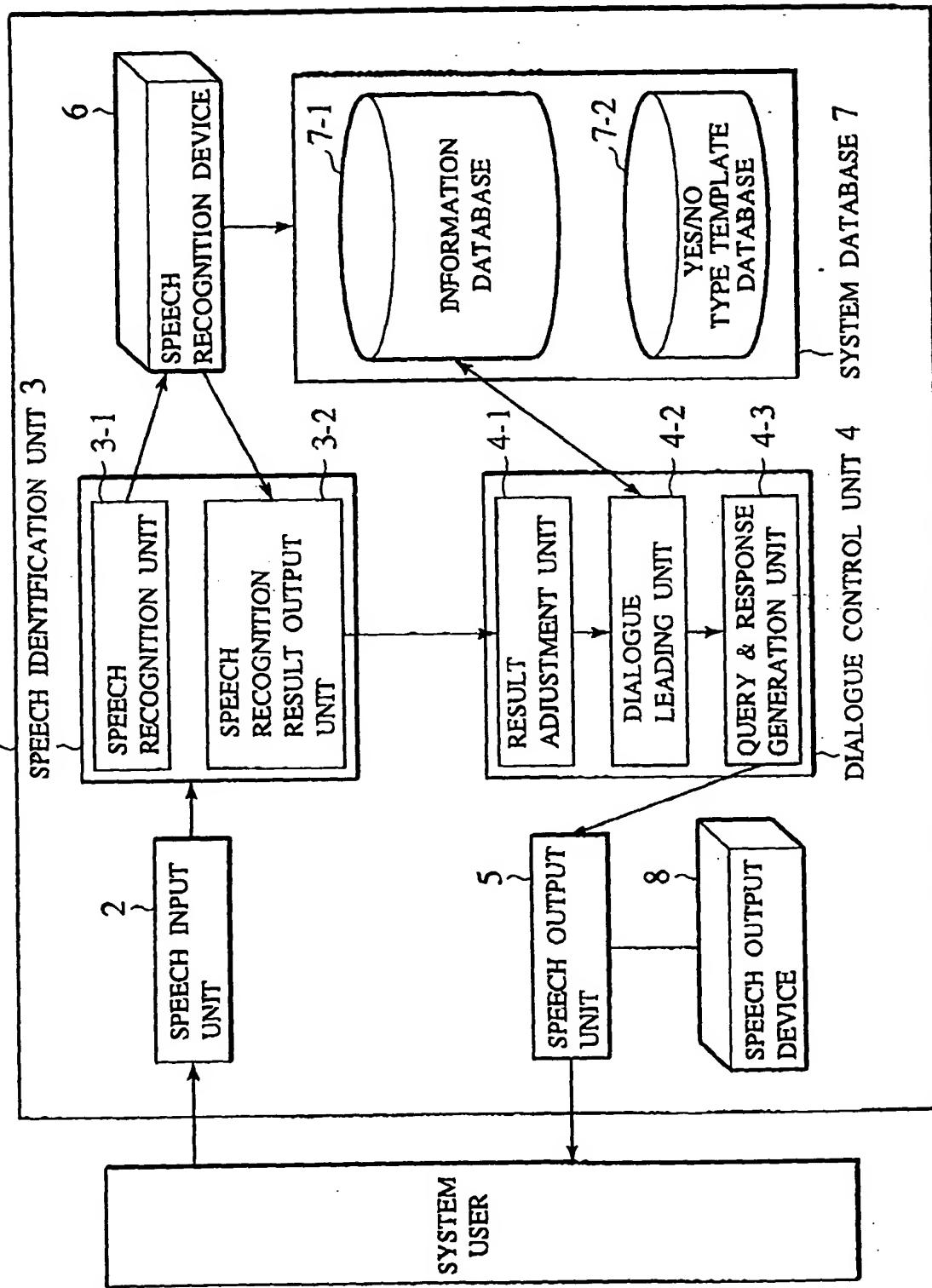
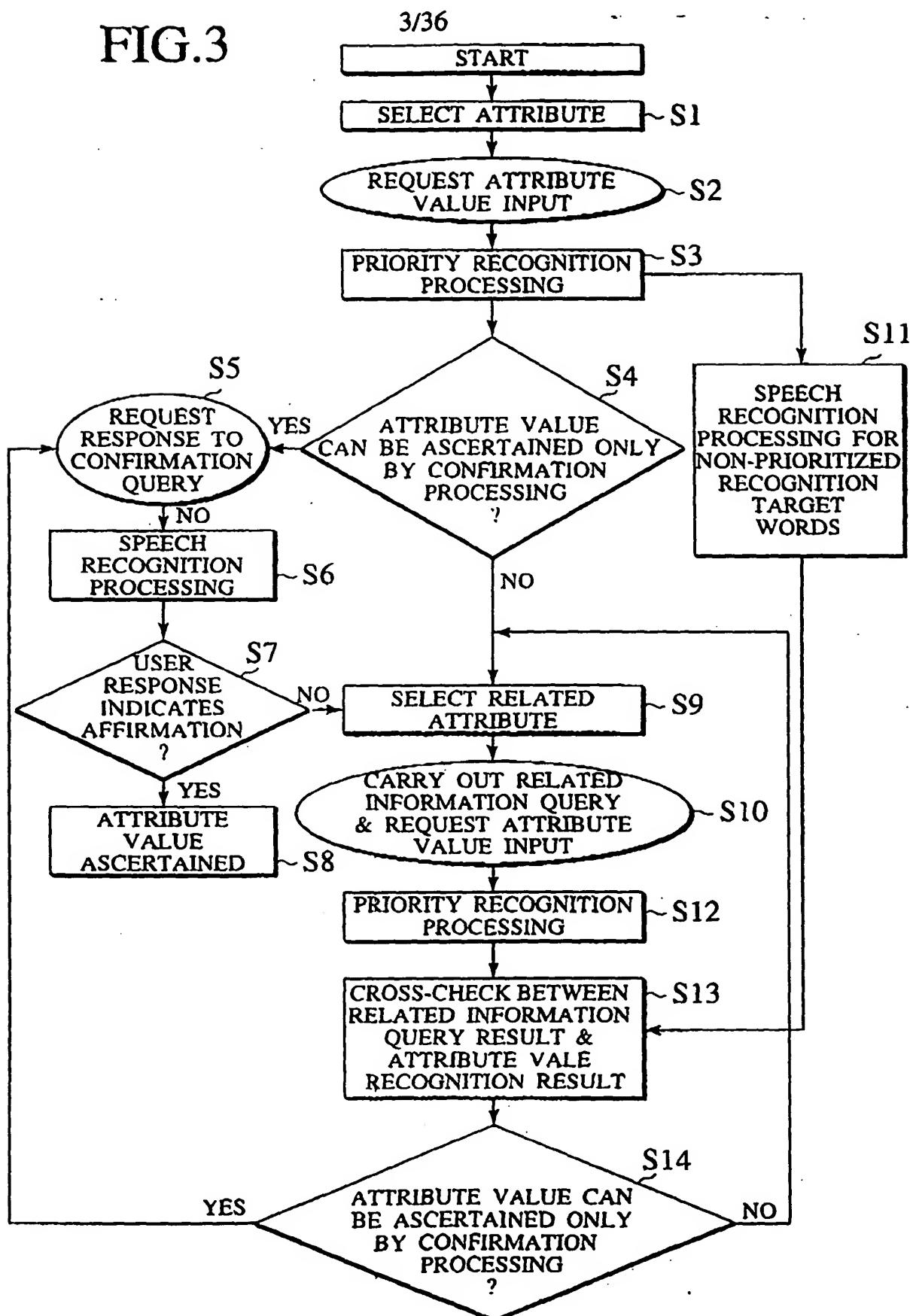


FIG.2

ATTRIBUTE VALUES OF ATTRIBUTE #1	ATTRIBUTE VALUES OF ATTRIBUTE #2	...	ATTRIBUTE VALUES OF ATTRIBUTE # α
ATTRIBUTE VALUE #1 ₁	ATTRIBUTE VALUE #2 ₁	...	ATTRIBUTE VALUE # α ₁
ATTRIBUTE VALUE #1 ₁	ATTRIBUTE VALUE #2 ₁	...	ATTRIBUTE VALUE # α ₂
ATTRIBUTE VALUE #1 ₁		...	ATTRIBUTE VALUE # α ₃
ATTRIBUTE VALUE #1 ₁	ATTRIBUTE VALUE #2 ₁	...	ATTRIBUTE VALUE # α ₄
:	ATTRIBUTE VALUE #2 ₂	...	
	ATTRIBUTE VALUE #2 ₂	...	
	ATTRIBUTE VALUE #2 ₃	...	
ATTRIBUTE VALUE #1 ₁		...	
ATTRIBUTE VALUE #1 ₂	ATTRIBUTE VALUE #2 ₁	...	
ATTRIBUTE VALUE #1 ₂		...	
	ATTRIBUTE VALUE #2 _j	...	
		...	
ATTRIBUTE VALUE #1 ₂		...	
ATTRIBUTE VALUE #1 ₃	ATTRIBUTE VALUE #2 ₁	...	
:		...	
ATTRIBUTE VALUE #1 ₃		...	
:		...	
ATTRIBUTE VALUE #1 _n		...	
ATTRIBUTE VALUE #1 _n		...	
:	ATTRIBUTE VALUE #2 _p	...	
ATTRIBUTE VALUE #1 _n	ATTRIBUTE VALUE #2 _p	...	ATTRIBUTE VALUE # α ₂

FIG.3



ATTRIBUTE VALUES OF ATTRIBUTE #1 (PREFECTURE)	ATTRIBUTE VALUES OF ATTRIBUTE #2 (CITY/TOWN)	ATTRIBUTE VALUES OF ATTRIBUTE #3 (SECTION)
TOKYO	MINATO	ROPPONGI
TOKYO	MINATO	AKASAKA
TOKYO	MINATO	SHIBA
TOKYO	MINATO	DAIBA
TOKYO	MINATO	
TOKYO	CHUOU	GINZA
TOKYO	CHUOU	NIHONBASHI
TOKYO	CHUOU	
TOKYO		
TOKYO	CHIYODA	
TOKYO	CHIYODA	
TOKYO		
TOKYO	SUGINAMI	
TOKYO	SUGINAMI	
KANAGAWA	YOKOHAMA	ISOGO
KANAGAWA	YOKOHAMA	KANAZAWA
KANAGAWA		
KANAGAWA	YOKOSUKA	HIKARINOOKA
KANAGAWA		NAGASAWA
KANAGAWA	CHIGASAKI	

FIG.4

FIG.5

OUTPUT ORDER	ATTRIBUTE VALUE (CITY/TOWN) CANDIDATE	RECOGNITION LIKELIHOOD
1	AMAGASAKI	970
2	CHUOU	900
3	YOKKAICHI	820
4	CHIYODA	710
...
...
50	YOKOHAMA	...
...
...
100	YOKOSUKA	14

DESCENDING ORDER OF RECOGNITION LIKELIHOOD



FIG.6

OUTPUT ORDER	ATTRIBUTE VALUE (CITY/TOWN) CANDIDATE	RECOGNITION LIKELIHOOD
1	CHIGASAKI	1,200
2	TAKASAKI	1,050
3	TAKAMATU	980
4	AMAGASAKI	970
.	.	.
10	YOKKAICHI	820
.	.	.
500	YOKOHAMA	.
.	.	.
.	.	.
2100	NAHA	2

DESCENDING ORDER OF RECOGNITION LIKELIHOOD

**CITY/TOWN CONTAINED IN
NON-PRIORITIZED RECOGNITION TARGET WORDS**

FIG.7

OUTPUT ORDER	RELATED ATTRIBUTE VALUE CANDIDATE	RECOGNITION LIKELIHOOD
1	KAGAWA	1,020
2	KANAGAWA	1,000
3	ISHIKAWA	910
4	FUKUOKA	870
.	.	.
.	.	.
47	HOKKAIDO	34

DESCENDING ORDER OF RECOGNITION LIKELIHOOD

FIG.8

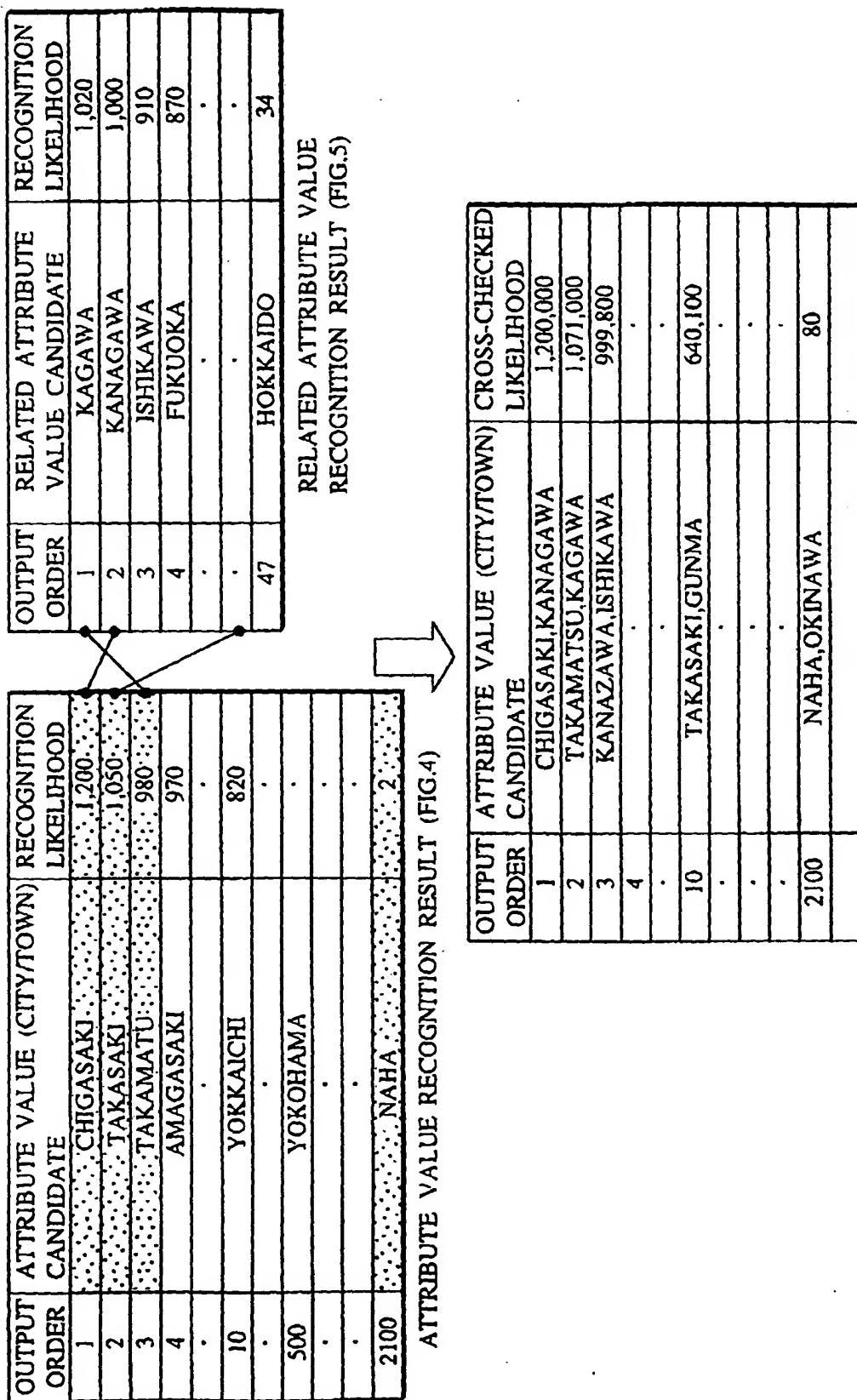


FIG.9 SPEECH RECOGNITION BASED INTERACTIVE INFORMATION RETRIEVAL APPARATUS 11

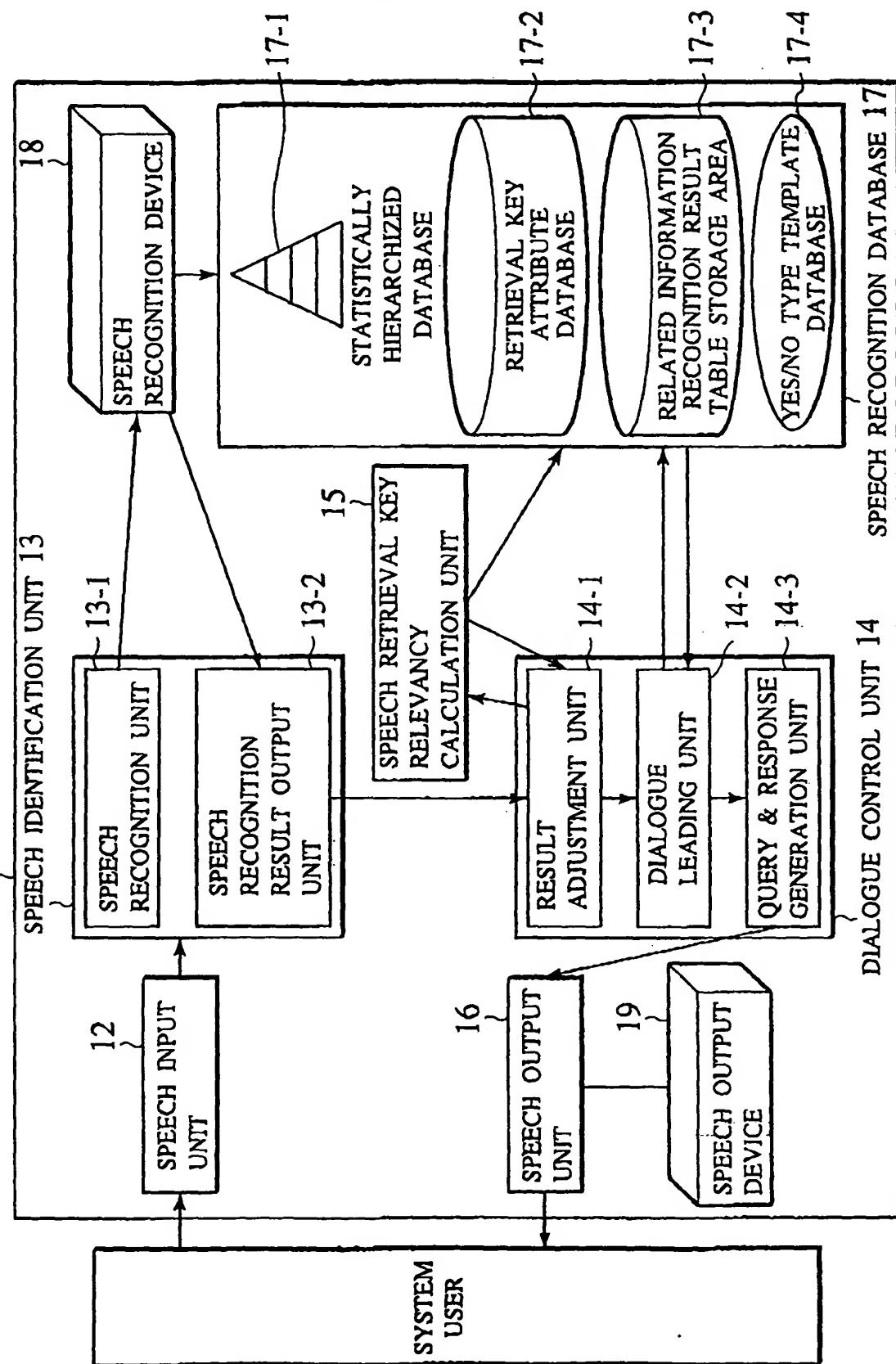


FIG. 10

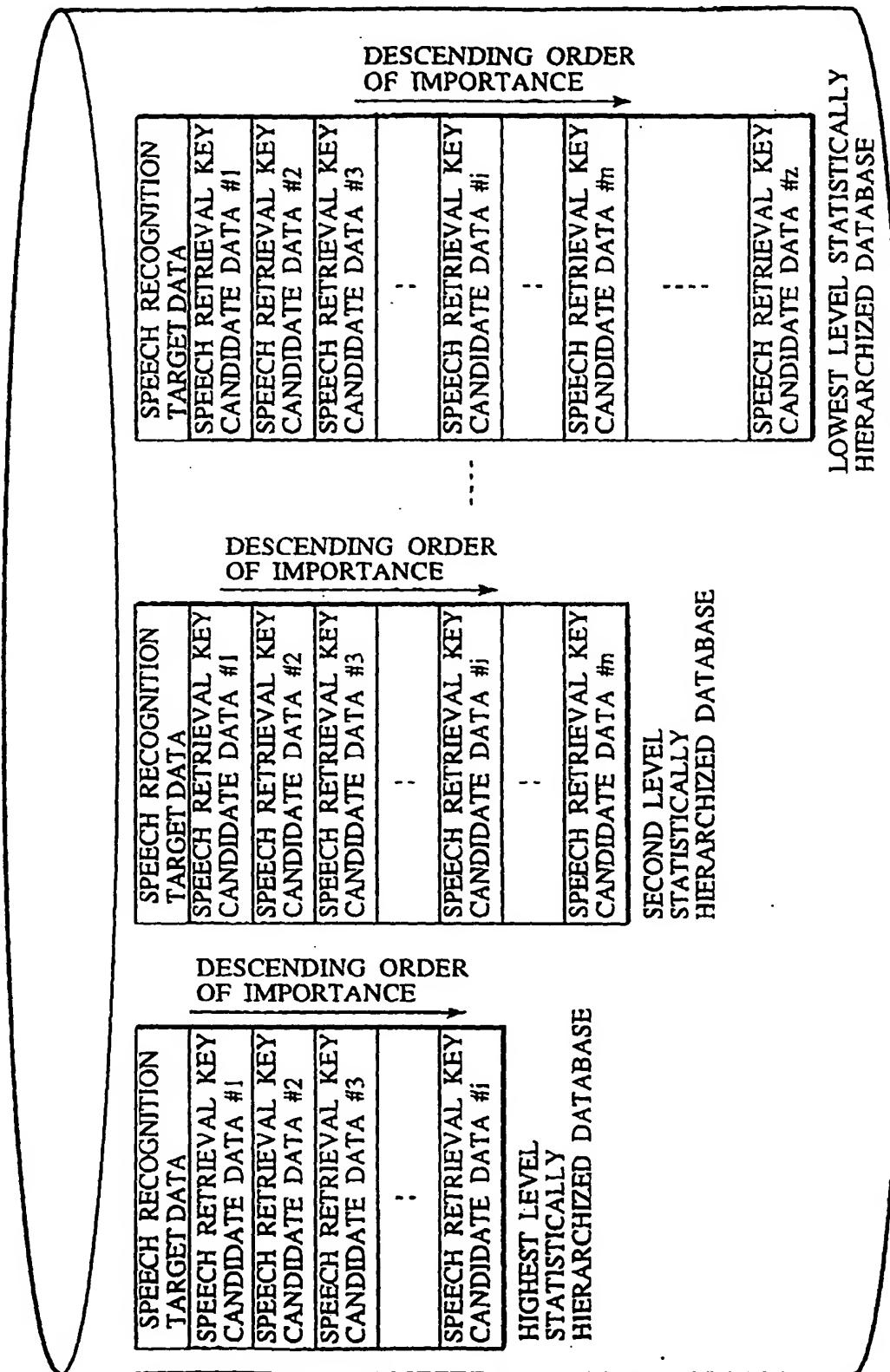
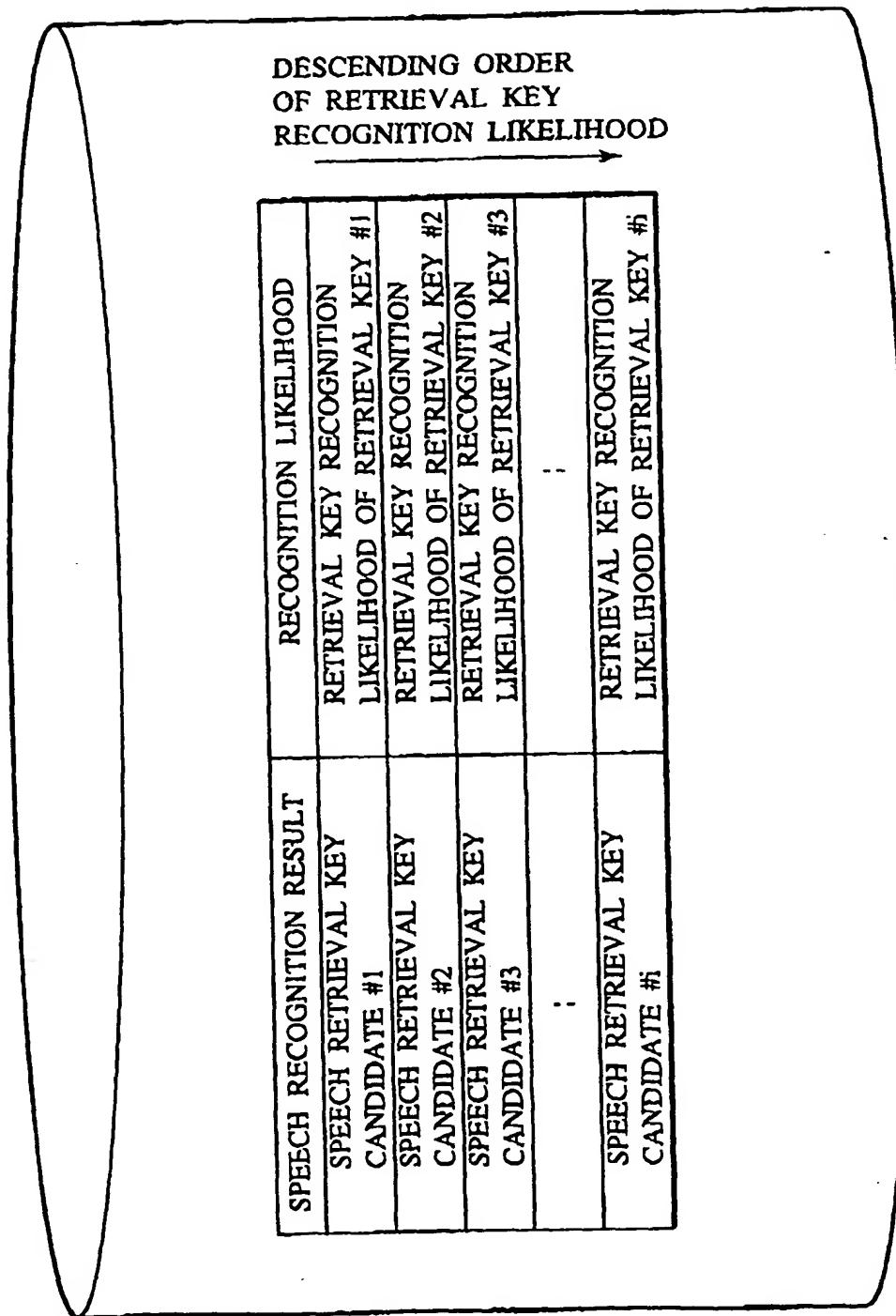


FIG.11



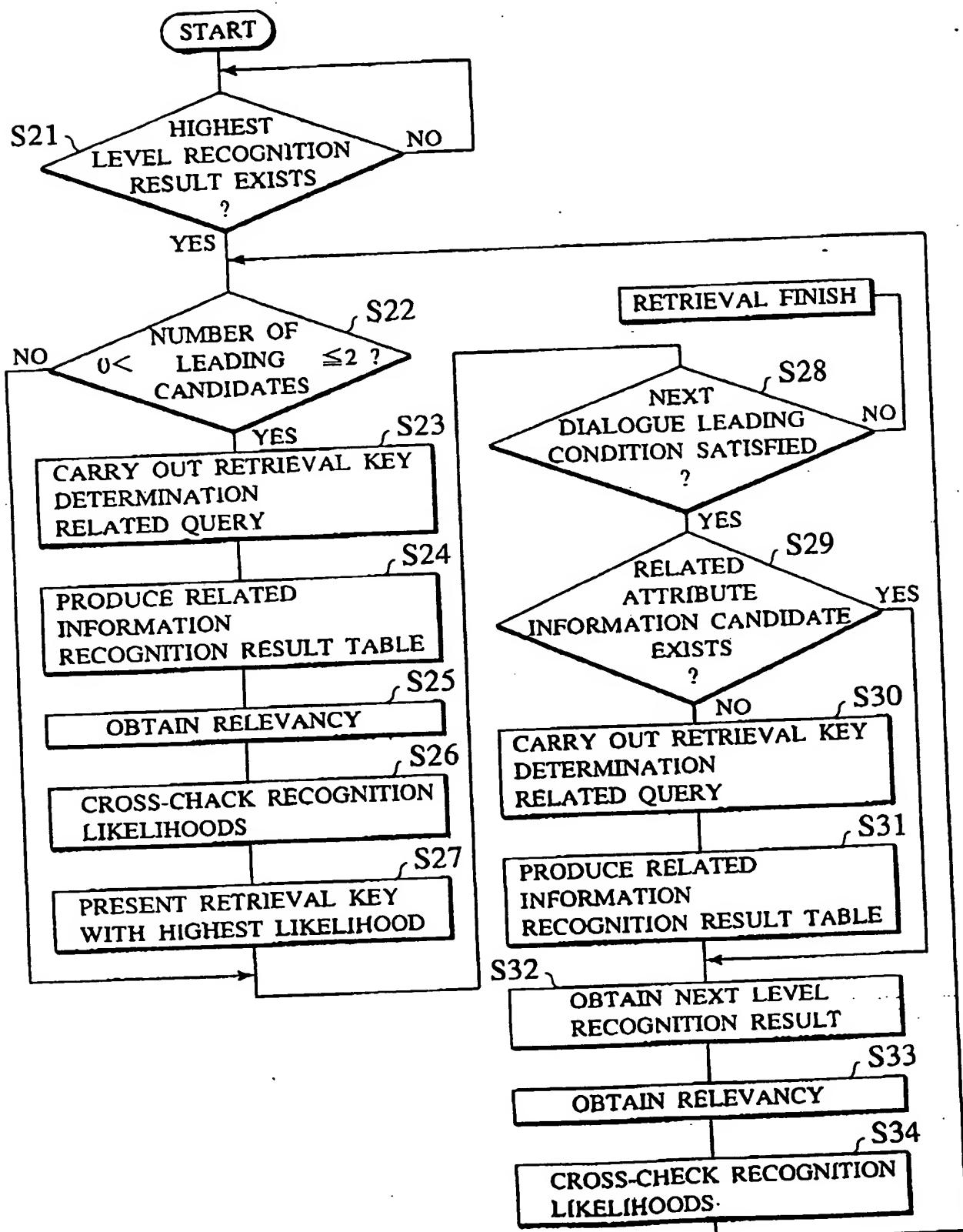
	RELATED ATTRIBUTE #1	RELATED ATTRIBUTE #m
SPEECH RETRIEVAL KEY #1	RELATED ATTRIBUTE OF RETRIEVAL KEY #1	RELATED ATTRIBUTE OF RETRIEVAL KEY #1
SPEECH RETRIEVAL KEY #2	RELATED ATTRIBUTE OF RETRIEVAL KEY #2	RELATED ATTRIBUTE OF RETRIEVAL KEY #2
SPEECH RETRIEVAL KEY #3	RELATED ATTRIBUTE OF RETRIEVAL KEY #3	RELATED ATTRIBUTE OF RETRIEVAL KEY #3
	.	.
SPEECH RETRIEVAL KEY #i	RELATED ATTRIBUTE OF RETRIEVAL KEY #i	RELATED ATTRIBUTE OF RETRIEVAL KEY #i
	.	.
SPEECH RETRIEVAL KEY #n	RELATED ATTRIBUTE OF RETRIEVAL KEY #n	RELATED ATTRIBUTE OF RETRIEVAL KEY #n
	.	.
SPEECH RETRIEVAL KEY #z	RELATED ATTRIBUTE OF RETRIEVAL KEY #z	RELATED ATTRIBUTE OF RETRIEVAL KEY #z

FIG.12

DESCENDING ORDER OF RELATED INFORMATION RECOGNITION LIKELIHOOD	
ATTRIBUTE INFORMATION	RELATED INFORMATION RECOGNITION LIKELIHOOD
RELATED INFORMATION CANDIDATE #1	RECOGNITION LIKELIHOOD OF RELATED INFORMATION CANDIDATE #1
RELATED INFORMATION CANDIDATE #2	RECOGNITION LIKELIHOOD OF RELATED INFORMATION CANDIDATE #2
RELATED INFORMATION CANDIDATE #3	RECOGNITION LIKELIHOOD OF RELATED INFORMATION CANDIDATE #3
RELATED INFORMATION CANDIDATE #n	RECOGNITION LIKELIHOOD OF RELATED INFORMATION CANDIDATE #n
RELATED INFORMATION CANDIDATE #2	RECOGNITION LIKELIHOOD OF RELATED INFORMATION CANDIDATE #2

FIG.13

FIG.14



15/36

FIG.15

	1ST LEVEL	2ND LEVEL	3RD LEVEL	4TH LEVEL
1	BERLIN PHILHARMONIC	BERLIN PHILHARMONIC	BERLIN PHILHARMONIC	BERLIN PHILHARMONIC
2	VIENNA PHILHARMONIC	VIENNA PHILHARMONIC	VIENNA PHILHARMONIC	VIENNA PHILHARMONIC
3	NEW YORK PHILHARMONIC	NEW YORK PHILHARMONIC	NEW YORK PHILHARMONIC	NEW YORK PHILHARMONIC
4	LONDON SYMPHONY	LONDON SYMPHONY	LONDON SYMPHONY	LONDON SYMPHONY
5	CHICAGO SYMPHONY	CHICAGO SYMPHONY	CHICAGO SYMPHONY	CHICAGO SYMPHONY
6	BOSTON SYMPHONY	BOSTON SYMPHONY	BOSTON SYMPHONY	BOSTON SYMPHONY
.				
.				
.				
59	VIENNA STATE OPERA	VIENNA STATE OPERA	VIENNA STATE OPERA	VIENNA STATE OPERA
60	METROPOLITAN OPERA	METROPOLITAN OPERA	METROPOLITAN OPERA	METROPOLITAN OPERA
.		.	.	.
.		.	.	.
.		.	.	.
90		GUSTAV LEONHARDT	GUSTAV LEONHARDT	GUSTAV LEONHARDT
.		.	.	.
149		HESPERION XX	HESPERION XX	HESPERION XX
150		CONSORT OF MUSICKE	CONSORT OF MUSICKE	CONSORT OF MUSICKE
.			.	.
.			.	.
.			.	.
.			.	.
249			SEQUENTIA	SEQUENTIA
250			HUEL GAS ENSEMBLE	HUEL GAS ENSEMBLE
.				.
.				.
.				.
350				LONDON SINFONIETTA

FIG. 16

	SPEECH RETRIEVAL KEY CANDIDATE	RECOGNITION LIKELIHOOD	NORMALIZED LIKELIHOOD
1	LONDON SYMPHONY	4,500	0.0375
2	BOSTON SYMPHONY	4,300	0.0358
3	NEW YORK PHILHARMONIC	3,900	0.0325
4	VIENNA STATE OPERA	3,700	0.0308
5	METROPOLITAN OPERA	3,700	0.0308
6	CHICAGO SYMPHONY	3,400	0.0283
.	.	.	.
60	PHILHARMONIA ORCHESTRA	1,600	0.0133
TOTAL		120,000	1.0000

DESCENDING ORDER OF RETRIEVAL
KEY RECOGNITION LIKELIHOOD



17/36

FIG.17

	RETRIEVAL KEY CANDIDATE	DATE	PLACE	DAY OF WEEK	PREFECTURE	STYLE
1	BERLIN PHILHARMONIC	APRIL 12	OPERA CITY	MON	TOKYO	ORCHESTRA
2	VIENNA PHILHARMONIC	MAY 30	SYMPHONY HALL	SUN	OSAKA	ORCHESTRA
3	NEW YORK PHILHARMONIC	APRIL 3	OPERA CITY	SAT	TOKYO	ORCHESTRA
4	LONDON SYMPHONY	MAY 30	SYMPHONY HALL	SUN	OSAKA	ORCHESTRA
5	CHICAGO SYMPHONY	APRIL 20	SUNTORY HALL	TUE	TOKYO	ORCHESTRA
6	BOSTON SYMPHONY	APRIL 10	OPERA CITY	SAT	TOKYO	ORCHESTRA
.
.
59	VIENNA STATE OPERA	APRIL 20	NHK HALL	TUE	TOKYO	OPERA
60	METROPOLITAN OPERA	APRIL 21	NHK HALL	WED	TOKYO	OPERA
.
.
90	GUSTAV LEONHARDT	MARCH 3	CASALS HALL	WED	TOKYO	BAROQUE
.
149	HESPERION XX	MARCH 30	FESTIVAL HALL	TUE	OSAKA	BAROQUE
150	CONSORT OF MUSICKE	APRIL 10	SUNTORY HALL	SAT	TOKYO	BAROQUE
.
.
249	SEQUENTIA	APRIL 2	ORCHARD HALL	FRI	TOKYO	RENAISSANCE
250	HUELgas ENSEMBLE	APRIL 21	TOKYO CATHEDRAL	WED	TOKYO	RENAISSANCE
.
.
350	LONDON SINFONIETTA	MARCH 3	FESTIVAL HALL	WED	OSAKA	CONTEMPORARY

FIG.18

	ATTRIBUTE INFORMATION CANDIDATE	RELATED INFORMATION LIKELIHOOD	NORMALIZED LIKELIHOOD
1	MARCH 5	5,600	0.0102
2	MARCH 10	5,400	0.0098
3	MARCH 4	4,800	0.0090
4	APRIL 10	4,400	0.0080
5	MARCH 3	4,200	0.0077
6	APRIL 3	3,500	0.0064
7	MARCH 30	3,000	0.0055
.	.	.	.
.	.	.	.
61	APRIL 20	1,100	0.0020
TOTAL		549,000	1.0000

DESCENDING ORDER OF RELATED INFORMATION LIKELIHOOD

19/36

FIG.19

	SPEECH RETRIEVAL KEY CANDIDATE	RECOGNITION LIKELIHOOD	NORMALIZED LIKELIHOOD
1	HESPERION XX	4,200	0.0080
2	CONSORT OF MUSICKE	4,020	0.0077
3	LONDON SYMPHONY	3,900	0.0074
4	GUSTAV LEONHARDT	3,800	0.0072
5	BOSTON SYMPHONY	3,500	0.0067
6	CHICAGO SYMPHONY	2,800	0.0053
.	.	.	.
.	.	.	.
60	ENSEMBLE ORGANUM	1,900	0.0036
.	.	.	.
.	.	.	.
150	GOTHIC VOICES	240	0.0004
TOTAL		525,000	1.0000

DESCENDING
ORDER OF
RETRIEVAL
KEY
RECOGNITION
LIKELIHOOD

FIG.20

Title: Speech Recognition Based Interactive Information Retrieval Scheme Using Dialogue Control to Reduce User Stress
 Inventor: Kumiko Ohmori et al.

20/36

RETRIEVAL KEY
ATTRIBUTE DATABASE

SPEECH RETRIEVAL KEY CANDIDATE	RECOGNITION LIKELIHOOD	NORMALIZED LIKELIHOOD
1 HESPERION XX	4.200	0.0080
2 CONSORT OF MUSICKE	4.020	0.0077
3 LONDON SYMPHONY	3.900	0.0074
4 GUSTAV LEONHARDT	3.800	0.0072
5 BOSTON SYMPHONY	3.500	0.0067
6 CHICAGO SYMPHONY	2.800	0.0053
...
60 ENSEMBLE ORGANUM	1.900	0.0036
...
...
150 GOTHIc VOICES	240	0.0004
	525,000	1.0000

INITIAL LIKELIHOOD THRESHOLD

	ATTRIBUTE INFORMATION CANDIDATE	RELATED INFORMATION LIKELIHOOD	NORMALIZED LIKELIHOOD
1	MARCH 5	5,600	0.0102
2	MARCH 10	5,400	0.0098
3	MARCH 5	4,800	0.0090
4	APRIL 10	4,400	0.0080
5	MARCH 3	4,200	0.0077
6	APRIL 3	3,500	0.0064
7	MARCH 30	3,000	0.0055
...
61	MARCH 31	1,100	0.0020
	TOTAL	549,000	1.0000

RELATED INFORMATION RECOGNITION
RESULT TABLE

	SPEECH RECOGNITION RESULT	NEW RECOGNITION LIKELIHOOD	NORMALIZED NEW LIKELIHOOD	RENEWED LIKELIHOOD	THRESHOLD
1	CONSORT OF MUSICKE	0.000062	0.2897		
2	GUSTAV LEONHARDT	0.000056	0.2593		
3	BOSTON SYMPHONY	0.000054	0.2523		
4	HESPERION XX	0.000044	0.2056		
5	LONDON SYMPHONY	0.000000	0.0000		
		0.0000216	1.0000		

SPEECH RECOGNITION RESULT TABLE FOR
SECOND STATISTICALLY HIERARCHIZED DATABASE

FIG.21

	ATTRIBUTE INFORMATION CANDIDATE	RELATED INFORMATION LIKELIHOOD	NORMALIZED LIKELIHOOD
1	CASALS HALL	4,200	0.0833
2	ORCHARD HALL	3,900	0.0774
3	FESTIVAL HALL	3,700	0.0734
4	SYMPHONY HALL	2,200	0.0436
5	NHK HALL	2,000	0.0397
6	SUNTORY HALL	2,000	0.0397
.	.	.	.
.	.	.	.
40	OPERA CITY	1,400	0.0278
TOTAL		50,400	1.0000

DESCENDING ORDER OF RELATED INFORMATION LIKELIHOOD



FIG.22

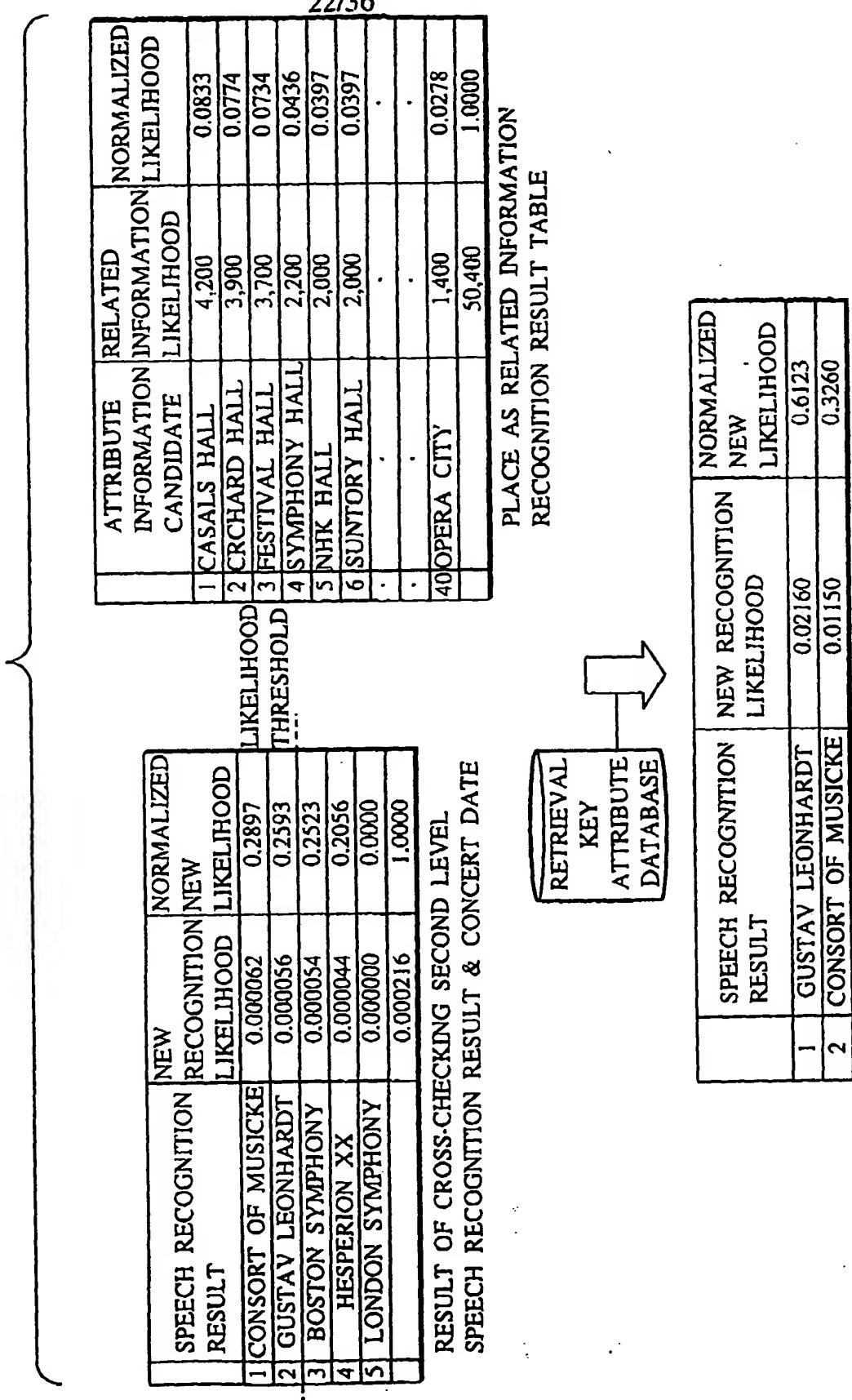
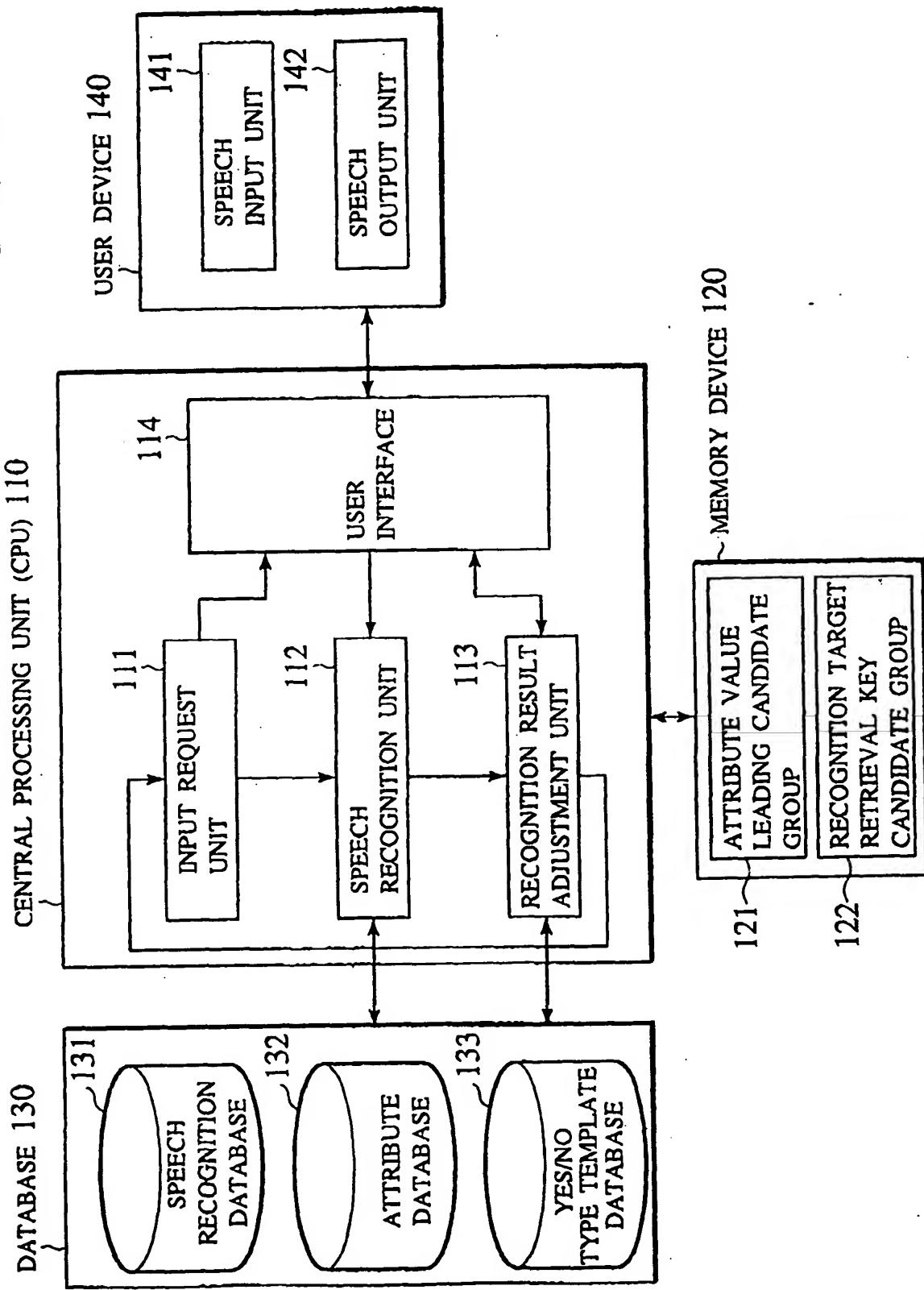


FIG.23



24/36

FIG.24

131

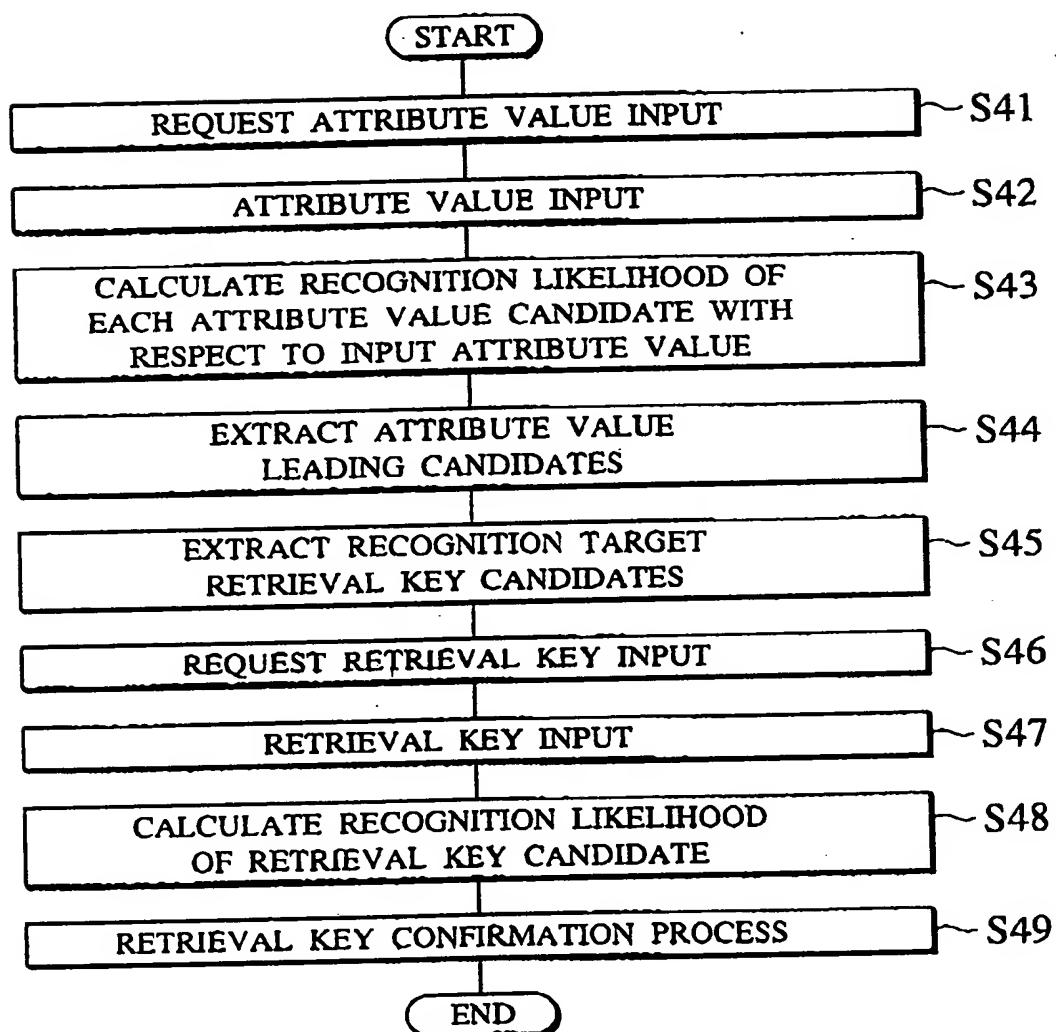
RETRIEVAL KEY CANDIDATE	ATTRIBUTE ITEM #1	ATTRIBUTE ITEM #2			ATTRIBUTE ITEM #n
RETRIEVAL KEY #1	ATTRIBUTE VALUE #1-10	ATTRIBUTE VALUE #2-2	.	.	ATTRIBUTE VALUE #n-11
RETRIEVAL KEY #2	ATTRIBUTE VALUE #1-2	ATTRIBUTE VALUE #2-9	.	.	ATTRIBUTE VALUE #n-1
RETRIEVAL KEY #3	ATTRIBUTE VALUE #1-k	ATTRIBUTE VALUE #2-12	.	.	ATTRIBUTE VALUE #n-k
.
.
RETRIEVAL KEY #k	ATTRIBUTE VALUE #1-5	ATTRIBUTE VALUE #2-21	.	.	ATTRIBUTE VALUE #n-3

FIG.25

132

ATTRIBUTE ITEM #1	ATTRIBUTE ITEM #2	.	.	ATTRIBUTE ITEM #n
ATTRIBUTE VALUE CANDIDATE #1-1	ATTRIBUTE VALUE CANDIDATE #2-1	.	.	ATTRIBUTE VALUE CANDIDATE #n-1
ATTRIBUTE VALUE CANDIDATE #1-2	ATTRIBUTE VALUE CANDIDATE #2-2	.	.	ATTRIBUTE VALUE CANDIDATE #n-2
ATTRIBUTE VALUE CANDIDATE #1-3	ATTRIBUTE VALUE CANDIDATE #2-3	.	.	ATTRIBUTE VALUE CANDIDATE #n-3
.
.
ATTRIBUTE VALUE CANDIDATE #1-k	ATTRIBUTE VALUE CANDIDATE #2-k	.	.	ATTRIBUTE VALUE CANDIDATE #n-k

FIG.26



26/36

FIG.27

131

RETRIEVAL KEY CANDIDATE	PREFECTURE	DISTRICT	.	.	SEASIDE OR NOT
SAPPORO	HOKKAIDO	HOKKAIDO	.	.	NO
ASAHIKAWA	HOKKAIDO	HOKKAIDO	.	.	YES
.
YOKOHAMA	KANAGAWA	KANTO	.	.	YES
.
NAHA	OKINAWA	KYUSHU	.	.	YES

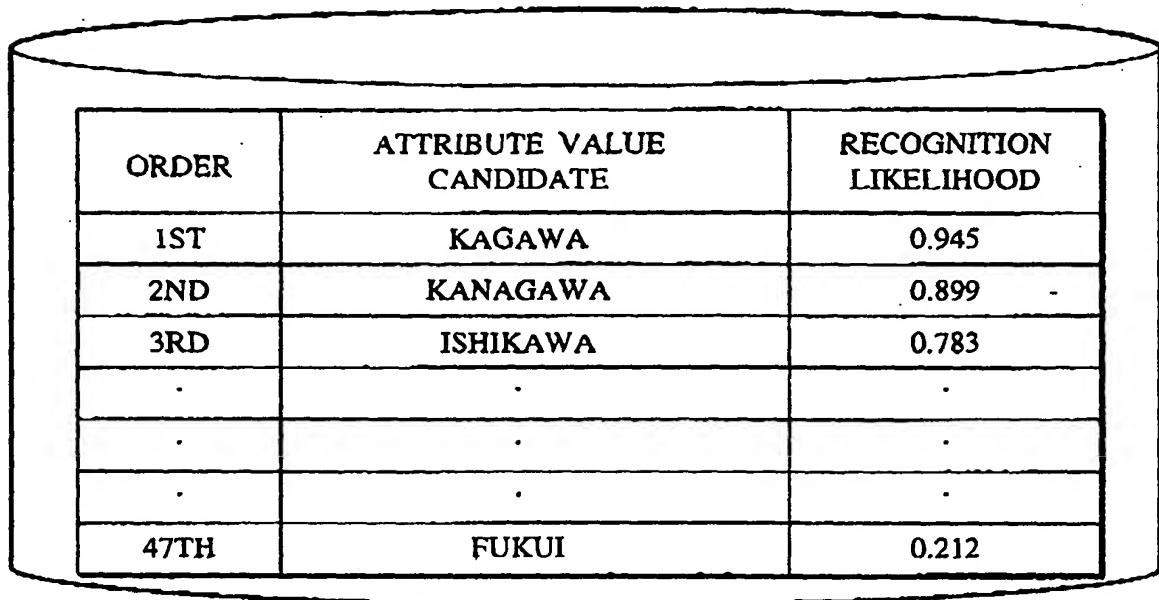
FIG.28

132

PREFECTURE	DISTRICT	.	.	SEASIDE OR NOT	.
HOKKAIDO	HOKKAIDO	.	.	YES	.
AOMORI	TOHOKU	.	.	NO	.
AKITA	KANTO	.	.	.	.
.	TOKAI	.	.	.	.
KANAGAWA	KINKI	.	.	.	.
TOKYO	HOKURIKU	.	.	.	.
.	SANIN	.	.	.	.
.	SHIKOKU	.	.	.	.

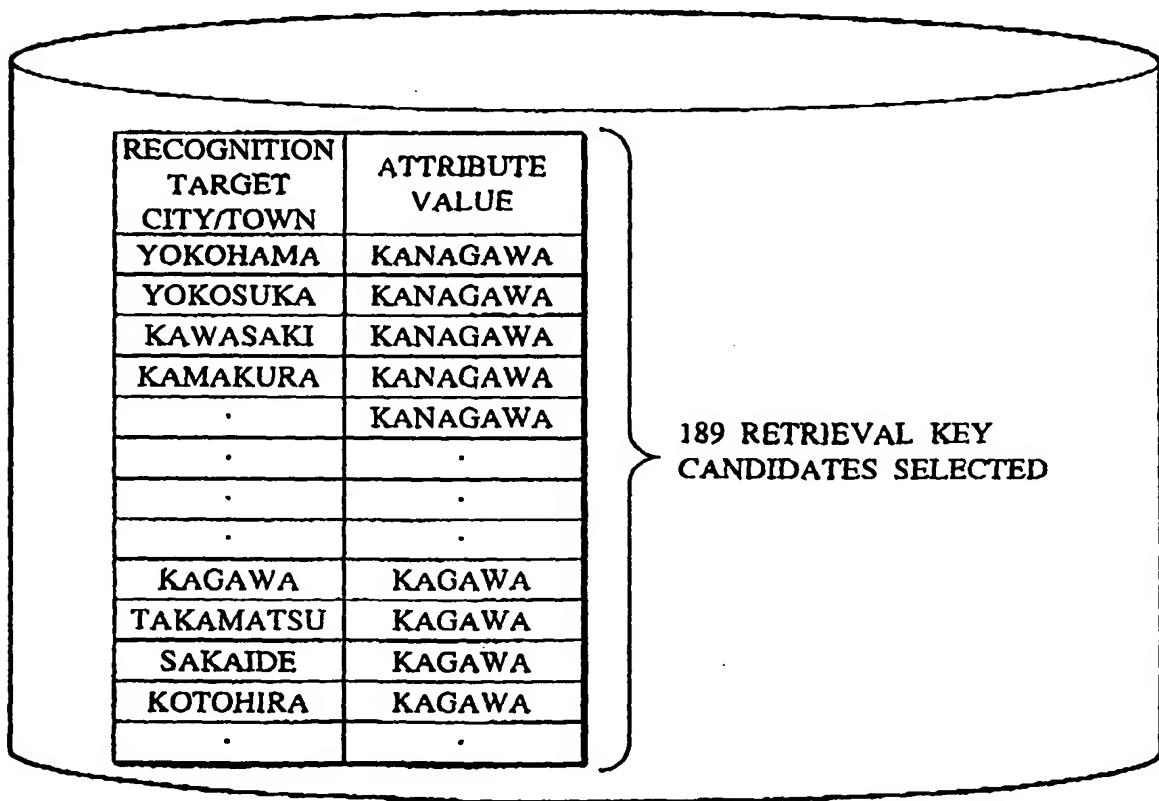
27/36

FIG.29



ORDER	ATTRIBUTE VALUE CANDIDATE	RECOGNITION LIKELIHOOD
1ST	KAGAWA	0.945
2ND	KANAGAWA	0.899
3RD	ISHIKAWA	0.783
.	.	.
.	.	.
.	.	.
47TH	FUKUI	0.212

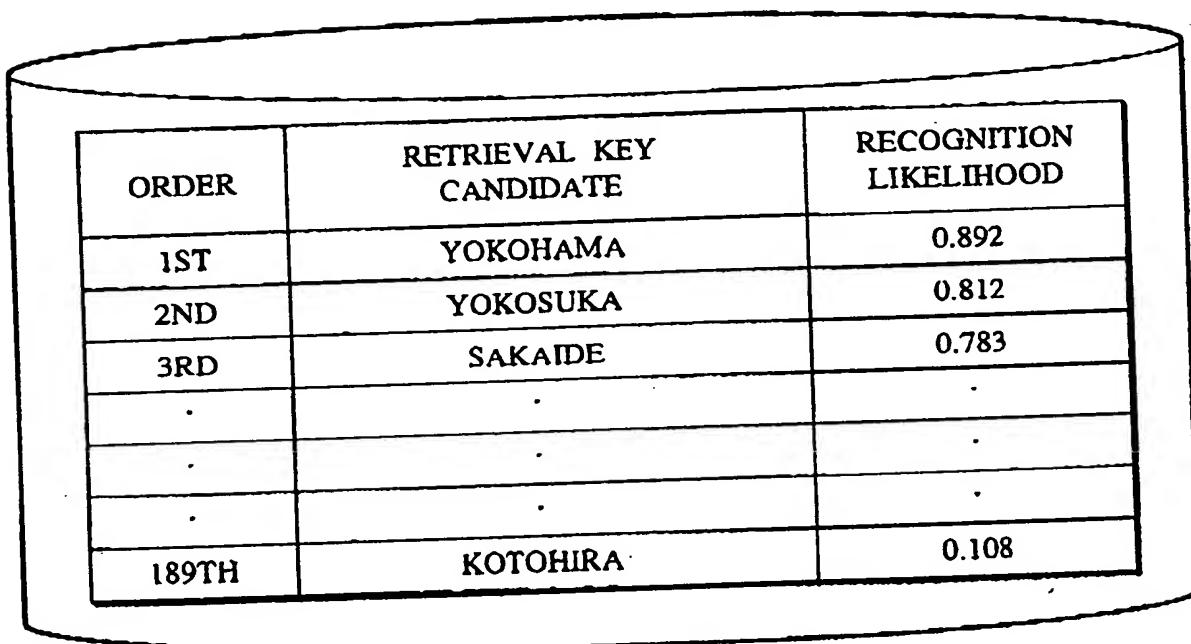
FIG.30



RECOGNITION TARGET CITY/TOWN	ATTRIBUTE VALUE
YOKOHAMA	KANAGAWA
YOKOSUKA	KANAGAWA
KAWASAKI	KANAGAWA
KAMAKURA	KANAGAWA
.	KANAGAWA
.	.
.	.
KAGAWA	KAGAWA
TAKAMATSU	KAGAWA
SAKAIDE	KAGAWA
KOTOHIRA	KAGAWA
.	.

189 RETRIEVAL KEY CANDIDATES SELECTED

FIG.31



A cylindrical container, resembling a can or a cup, is shown holding a table of retrieval results. The table has three columns: 'ORDER', 'RETRIEVAL KEY CANDIDATE', and 'RECOGNITION LIKELIHOOD'. The data is as follows:

ORDER	RETRIEVAL KEY CANDIDATE	RECOGNITION LIKELIHOOD
1ST	YOKOHAMA	0.892
2ND	YOKOSUKA	0.812
3RD	SAKAIDE	0.783
.	.	.
.	.	.
189TH	KOTOHIRA	0.108

FIG.32
SPEECH RECOGNITION BASED INTERACTIVE INFORMATION RETRIEVAL APPARATUS 201

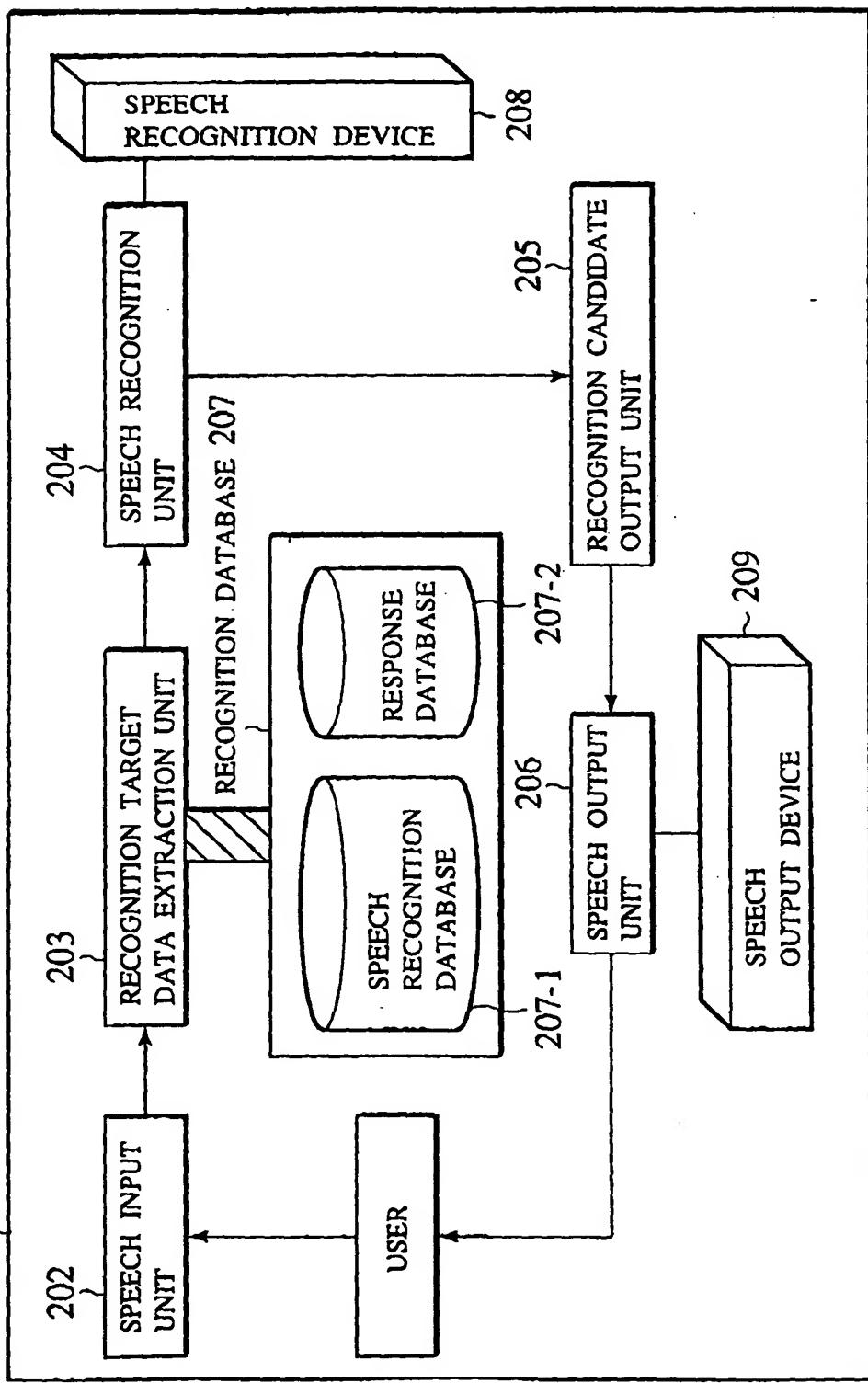


FIG. 33

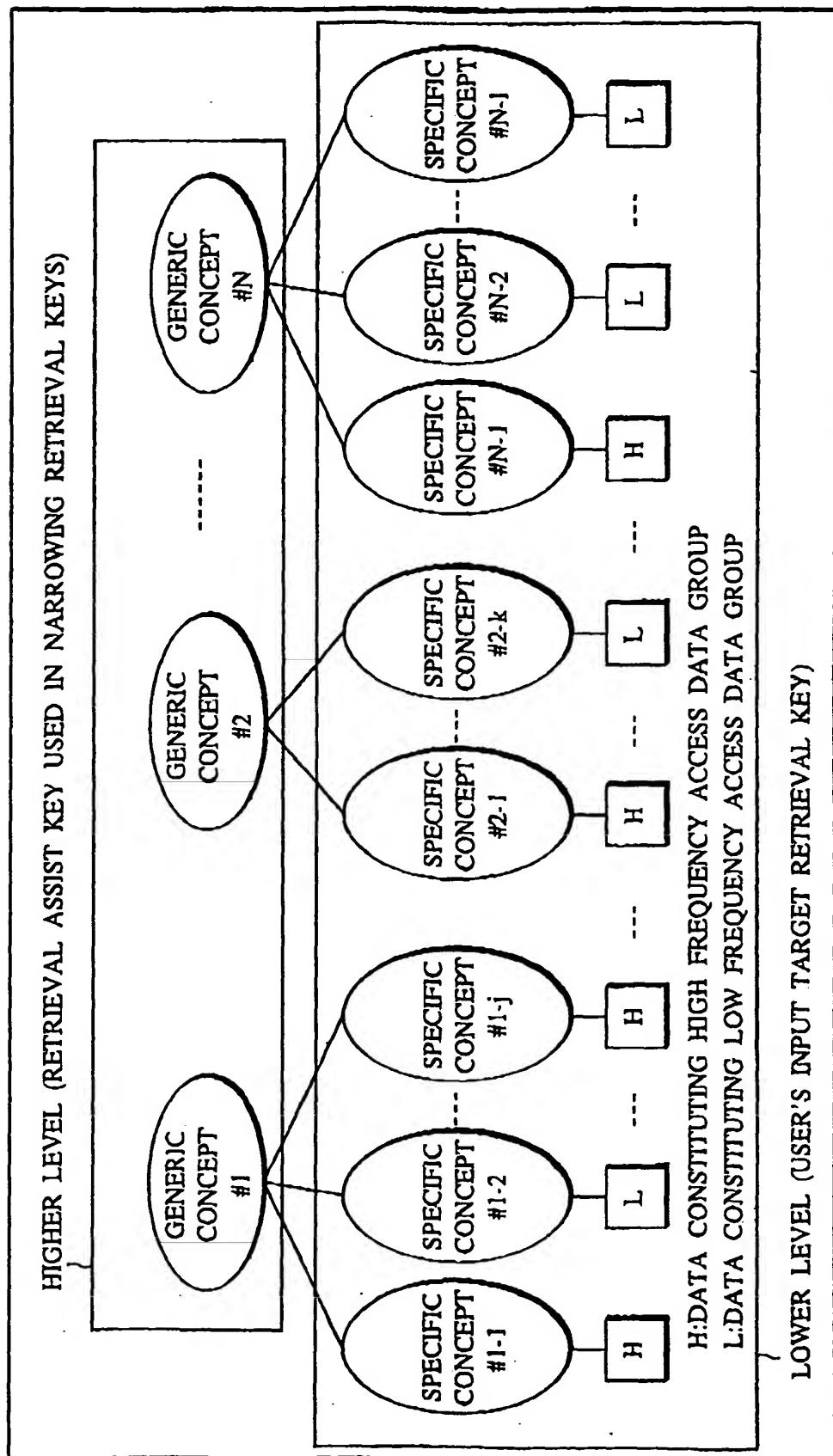


FIG.34

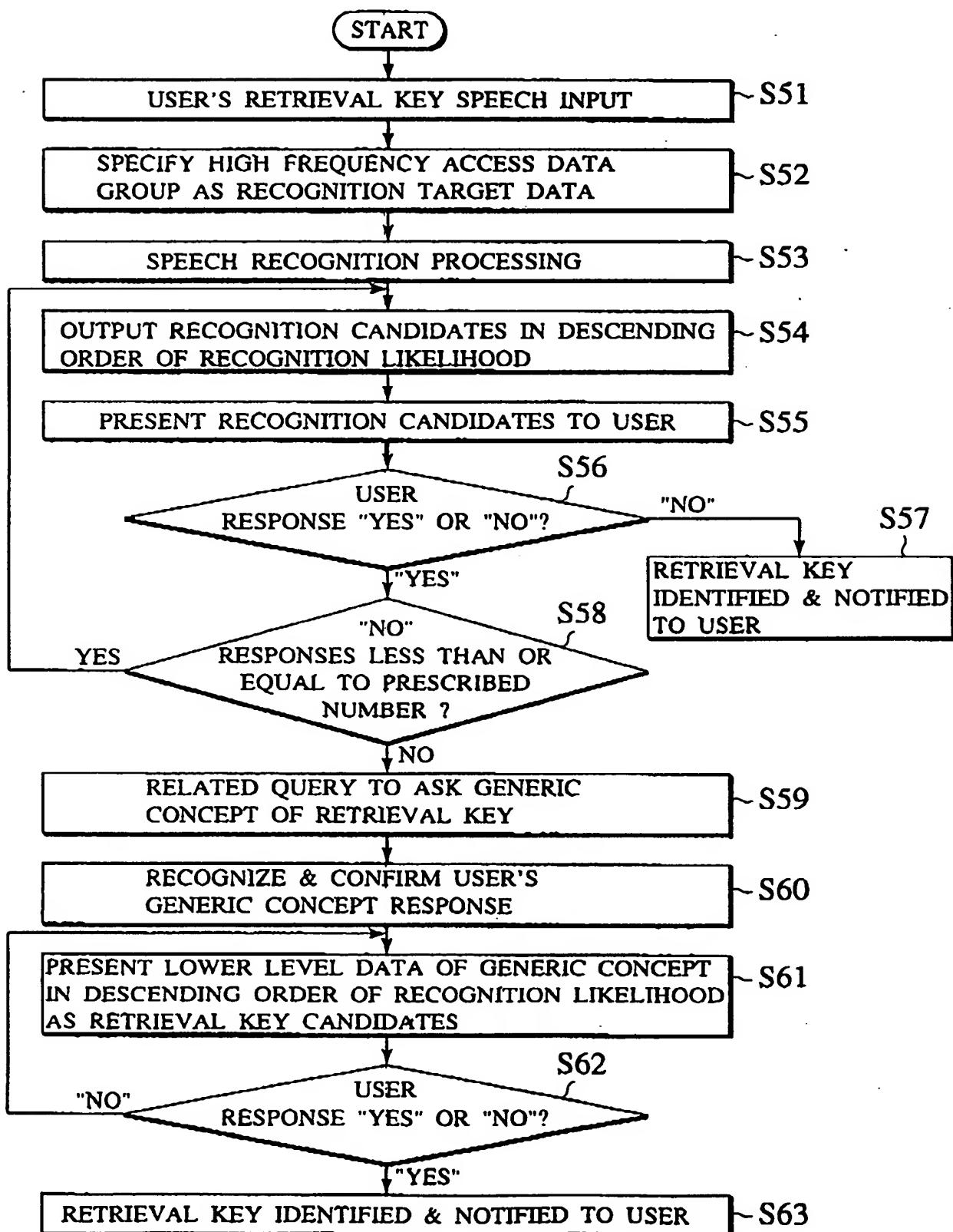


FIG.35

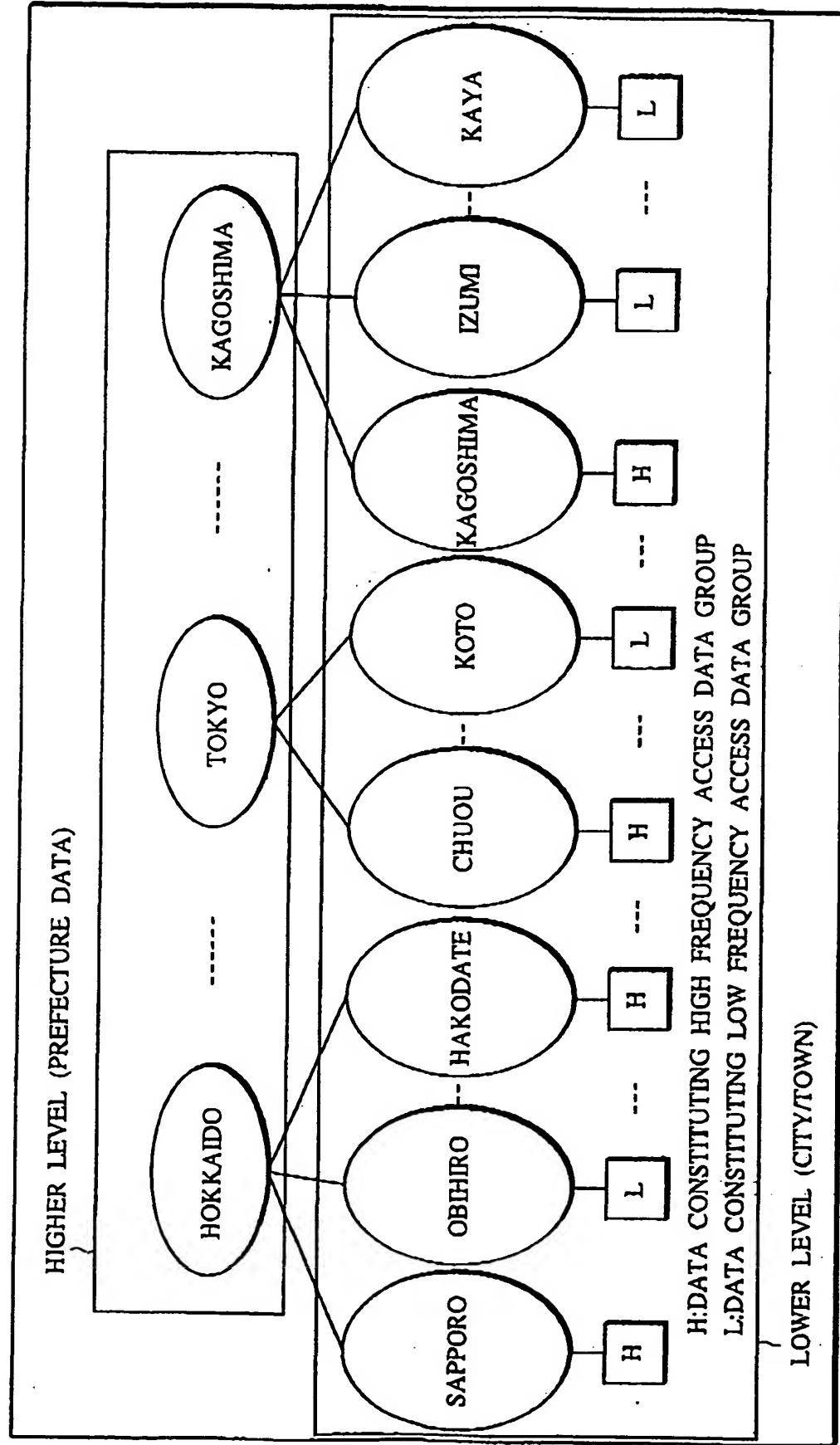


FIG.36

ACCESS FREQUENCY	CITY/TOWN
1ST	MINATO
2ND	CHUOU
3RD	SHIBUYA
4TH	YOKOHAMA
5TH	SHINJUKU
.	.
.	.
49TH	OSAKA
50TH	MAIHAMA

DESCENDING
ORDER OF
ACCESS
FREQUENCY



FIG.37

ORDER	CITY/TOWN
1ST	YOKOSUKA
2ND	YOKOHAMA
3RD	YOTSUGI
4TH	MAIHAMA
.	.
.	.
50TH	MINATO

DESCENDING
ORDER OF
RECOGNITION
LIKELIHOOD



FIG.38

ORDER	CITY/TOWN
1ST	YOKOHAMA
2ND	YOKOSUKA
3RD	YOKOYAMA
4TH	MIHAMA
.	.
.	.
50TH	CHIBA

DESCENDING
ORDER OF
RECOGNITION
LIKELIHOOD



FIG.39

ORDER	CITY/TOWN
1ST	YOKOKAWA
2ND	TAKASAKI
3RD	MAEHASHI
.	.
.	.
.	.
41TH	KIRYU

DESCENDING
ORDER OF
RECOGNITION
LIKELIHOOD